

the expansion cylinder, and after performing work upon the piston, and returning about 60 per cent. of the power expended in its compression, it is exhausted, having been cooled down from 70° above to 90° below zero Fahr. Besides its application to the importation of dead meat, live cattle, &c., an interesting application was made last year in the construction of a tunnel through a hill in Stockholm, in the excavation of which, some running ground was met with, consisting of gravel mixed with clay and water, which it was determined to freeze. The innermost end of the tunnel next the face was formed into a freezing-chamber by means of partition walls, which were made of a double layer of wood filled in between with charcoal. The temperature of the freezing-chamber was generally from 6° to 15° below zero Fahr. after twelve hours' running, but soon rose to freezing-point when the men began to work. The tunnel was driven through its length of 80 feet with entire success, the daily progress averaging about 1 foot.

A paper on the distribution of the wheel-load in cycles, illustrated by means of fifty-six figures, was read by Mr. J. Alfred Griffiths. The author gives the following five points of efficiency as applying to cycles generally, viz. reduction of dead weight by the avoidance of very large wheels and of heavy or purely ornamental or unnecessary framing; reduction of resistance by avoidance of very small wheels, and by employment of the best designs in bearings and in driving-mechanism for the diminution of internal friction; perfection of load distribution by entire avoidance of wheels that neither transmit motive-power nor assist the steering, and by concentration of the load on the driving-wheels and reduction of that on the steering-wheels; stability when at rest and when in motion on the straight and round curves, when on a smooth surface and also on a rough and lumpy road, and when the brake is applied either suddenly or gradually; arrangement of load and driving-mechanism so that the distribution of the wheel-load shall be as good on rising or falling gradients as on a level. Tables of dimensions and distribution of wheel-load were appended.

A paper on the raising of the wrecked steamship *Peer of the Realm*, which was effected by the platforming method, and without the aid of divers for any part of the operation, was read by Mr. T. W. Wailes, of Cardiff.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

OXFORD.—The Council of Somerville Hall have decided to build additional rooms for twenty students. Two Entrance Scholarships of 35*l.* and 40*l.* a year are offered for competition on May 25.

SCIENTIFIC SERIALS

American Journal of Science, March.—Examination of Dr. Croll's hypothesis of geological climates, by Dr. A. Woeikof. The author subjects Dr. Croll's theories to a searching criticism, traversing all his fundamental principles. The statement that the ocean must stand at a higher mean temperature than the land is shown to be quite erroneous, the oceans which receive cold currents from Polar seas, and even seas like the Mediterranean and Red Sea, which receive no such currents, having a mean temperature considerably lower than the continents. His whole system of estimating temperature breaks down when seriously tested, the errors being enormous, in some cases upwards of 100° F., or greater than the difference of annual temperature between the equator and the North Pole. His hypotheses, although brilliant and fascinating, cannot be accepted, the main points on which they rest being opposed to the most certain teachings of meteorology, and the whole fabric in its explanation of glaciation and geological climates generally being entirely fallacious.—Tendrils movements in *Cucurbita maxima* and *C. Pepo* (concluded), by D. P. Penhallow. The author concludes generally that growth is promoted by an increase of temperature and humidity, but may be retarded by an increase of temperature when other conditions are unfavourable. It is also retarded by excessive transpiration, while the conditions favourable to growth, arising from temperature and humidity, may cause greater growth during the day in opposition to the retarding influence of light. Movements of tendrils and terminal buds, being phenomena of growth, are modified by whatever variations of condition affect growth.—Note on a method of measuring the surface-tension of liquids, by W. F. Magie. It

is shown that Poisson's formula determining approximately the height of a large liquid drop standing on a level plate holds good, without any change, for a bubble of air formed in a liquid under a level plate.—Remarks on W. B. Rogers's "Geology of the Virginias" (continued), by J. L. and H. D. Campbell. In this concluding paper the authors deal with the most salient points in the higher formations of the geological system of Virginia and West Virginia. Their remarks, based mainly on personal observation, are intended to be supplementary to Mr. Rogers's comprehensive treatise on the geology of this region.—Observations on the Tertiary of Mississippi and Alabama, with descriptions of new species, by D. W. Langdon. An important result of these observations is the establishment of the relation of the Jackson beds to the Orbitoides limestone and marl beds of Byram Station. The new species, which will be figured in the forthcoming Report of the Geological Survey of Alabama are: *Verticordia eocensis*, apparently the first *Verticordia* described from this epoch; and *Bulla (Haminea) aldrichi*, an elongate oval shell resembling *Bulla glaphyra*, Desh.—On the area of Upper Silurian rocks near Cornwall Station, Eastern Central Orange County, New York, by Nelson H. Darton. The paper contains a careful study of the Townsend Iron Mine district and vicinity, where a small mass of Lower Helderberg limestone has been protected from the general denudation by a firm backing of coarse strongly cemented sandstones. The whole forms a ridge running just west of Cornwall Station, its more prominent geological features being shown on the accompanying map.

Rivista Scientifico-Industriale, March 15.—On the crepuscular lights that followed the Krakatö eruption, by Prof. Alessandro Sandrucci. The author surveys with him the various theories propounded to explain this phenomenon, and rejects them all as inadequate, or else based on impossible assumptions. He concludes that for the present the after-glows must be classed with the numerous effects the causes of which have not yet been fathomed.—On the origin of atmospheric electricity, by Prof. Luigi Palmieri. A simple experiment is described, by which it is clearly shown that positive electricity is generated by the moisture of the air, when it becomes condensed by a lowering of the temperature. This conclusion is reconciled with the theory recently advanced by Prof. Edlund, of Stockholm, who argues that the electricity of the air is derived from the earth by the unipolar induction of terrestrial magnetism, while its return to the earth is caused by the condensation of the aqueous vapours, and especially by their conversion into the fluid state.

Rendiconti del Reale Istituto Lombardo, April 1.—Reptiles of the Orta-Kenei district, Adrianople, by Prof. F. Sordelli. This is an account of the collection recently made at the southern foot of the Balkan Range by the Cavaliere Luigi de Magistris, and by him presented to the Civic Museum of Milan. Of over twelve species of reptiles three only are found in the Po Valley, all the rest being of an essentially Eastern character, with a range extending from the Balkan Peninsula to the Iranian Plateau.—Note on a fundamental theorem in the theory of the functions of a complex variable quantity, by G. Morera.—Stratigraphic observations in the province of Avellino, by Prof. T. Taramelli. The paper contains a systematic study of the stratified rocks exposed by the cuttings of the Avellino and Santa-Venere line of railway, and ranging through the whole series from the Lower Chalk through the Eocene, Miocene, and Pliocene, to the more recent Quaternary formations.—Account of a rare and interesting ornithological specimen, by Prof. Pietro Pavesi. The author describes a fine specimen of *Bernicla leucopsis*, Bechst., recently shot at Corana in the Po Valley, and now preserved in the Civic Museum of Pavia.—On the rational curves in a linear space to any number of dimensions, by A. Brambilla.—Meteorological observations made at the Brera Observatory, Milan, during the month of March.

SOCIETIES AND ACADEMIES

LONDON

Zoological Society, May 4.—Prof. W. H. Flower, LL.D., F.R.S., President, in the chair.—Mr. E. L. Layard, F.Z.S., exhibited a rare example of a rare Beetle of the family Cerambycidae (*Macrotoma heros*), obtained in the Fiji Islands; and a series of specimens of shells of the genus *Bulimus* from New Caledonia and the adjacent islands.—A letter was read from Mr. F. W. Styan, F.Z.S., relating to some Chinese ani-

imals of which he had lately obtained specimens.—Mr. W. F. Kirby read some remarks on four rare species of Sphingidae, of which he had lately examined specimens.—Mr. F. E. Beddard read a paper containing observations on the ovarian ovum of *Lepidosiren* (Protopterus), and described the entrance of follicular cells into the interior of the ovum. It was believed that these cells played an important part in the formation of the yolk.—Mr. Beddard also communicated a paper by Mr. J. T. Cunningham, on the mode of attachment of the ovum of the smelt (*Osmerus eperlanus*).

PARIS

Academy of Sciences, May 3.—M. Jurien de la Gravière, President, in the chair.—On the magnetic principle, by M. Mascart. The author's theoretical studies lead to the general inference that, in a magnetic and isotropic body of any form there are three rectangular directions for which the magnetic force is parallel to the outer field with different coefficients, f , f_1 , and f_2 . These coefficients possess the same properties as those of a sphere of slightly magnetised anisotropic substance. For steel the mean coefficient of longitudinal magnetic force is much weaker than for soft iron; hence the increased importance of transverse magnetisation.—On the formation of oxalic acid in plants: a study of *Rumex acetosa* (sorrel), by MM. Berthelot and André. The analysis of the dried seeds of this plant yielded 0.05 per cent. of oxalic acid, which is also largely present in the leaves and stalk, but to a less degree in the root.—Remarks on MM. Berthelot and André's communication on the proportion and quantitative analysis of the ammonia present in the ground, which appeared in the last number of the *Comptes rendus*, by M. Th. Schloesing. The author takes exception to MM. Berthelot and André's account of his process for effecting the analysis, and also traverses the statement that arable land, when irrigated, tends constantly to liberate the ammonia of the ammoniacal salts contained in it.—On holmine, or M. Soret's earth X, by M. Lecoq de Boisbaudran. This was a sealed paper recently deposited with the Academy, and now opened at the author's request. It shows that holmine contains at least two metallic radicals.—On dysprosium (symbol Dy), by M. Lecoq de Boisbaudran.—Remarks on a work entitled "Science and Philosophy," presented to the Academy by the author, M. Berthelot.—Observations on the new comet 1886 a (Brooks I.), made at the Paris Observatory (equatorial of the West Tower), by M. G. Bigourdan.—On the spectrum of the Fabry Comet, by M. Ch. Trepied. In this comet, as in that of Encke, there appears to be a predominance of the gaseous elements on the one hand, while on the other its spectrum seems to show that the relative brightness of the nucleus bears no necessary relation to the degree of condensation of the cometary matter.—On the density of liquid atmospheric air and its constituent elements, and on the atomic volume of oxygen and nitrogen, by M. S. Wroblewski.—Practical method for the preparation of the Nicol and Foucault prisms (three illustrations), by M. L. Laurent.—On the penetration of light into deep seawater, by MM. H. Fol and E. Sarasin. From the author's experiments it appears that layers at a depth of 300 metres are illumined every day for the whole time that the sun remains above the horizon; at 350 metres light penetrates for at least eight hours daily. Even after sunset the actinic rays seem to reach considerable depths.—On the combinations of phosphoric acid with titanic acid, zircon, and stannic acid, by MM. P. Hautefeuille and J. Margottet. The general conclusion of the author's researches is that the phosphates of titanic acid, zircon, and stannic acid possess the atomic composition of the phosphate of silica. By employing phosphoric acid as a dissolvent they can be obtained only under the octahedric form, while the phosphate of silica is obtained not only under this but under three other forms incompatible with the first.—Action of vanadic acid on the ammoniacal salts, by M. A. Ditte.—On the constitution of butter, by M. E. Duclaux.—On xenotime, a rare mineral from Minas Geraes, Brazil, by M. H. Gorceix. This substance, which on analysis yields PhO_5 , 35.64, $\text{YO} + \text{ErO}$, 63.75, and insoluble residuum 0.4, appears to be a phosphate of yttria and of a second earth, very probably erbium.—On the endothelium of the inner wall of the vessels in invertebrates, by M. W. Vignal.—On the existence in birds of a series of cephalic ganglia of sympathetic character, corresponding to the segmentary cranial nerves, by M. F. Rochas.—Researches on the structure of the stomach in birds, by M. M. Cazin.—On *Eutoniscus menadis*, a parasite infesting the *Carcinus menas* crab,

by M. A. Giard.—On some phenomena connected with the division of the cellular nucleus in plants, by M. L. Guignard.—Remarks on M. Boudroux's recent communication on an acid fermentation of glucose, by M. Maumené. The author shows that this acid differs in no respect from that already determined and described by him in the year 1875, under the name of "hexepic."

BERLIN

Physiological Society, March 26.—Dr. Kossel communicated the results of experiments instituted by Dr. Schotten respecting the cholic acids. As was known, two different nitrogenous acids entered into the composition of the bile, glycocholic acid and taurocholic acid, which broke up respectively into glycocholl and cholic acid, and into taurin and cholic acid. The constitution of this azoteless acid, common to both, had not yet been determined. It was, however, known to be different with different animals. In the bile of horned cattle two cholic acids had been found, distinguished as taurocholic acid and choleic acid. In the bile of swine a third cholic acid had been found, hypocholic acid; and in the bile of geese, a fourth, chenocholic acid. It was probable that still more cholic acids would be discovered. Dr. Schotten's studies had for their object the elucidation of the constitution of cholic acid. By heating to 300° C. he was able to split two molecules of water, and to obtain a body of an equal quantity of carbon, a less quantity of hydrogen and of oxygen. By subjection to a still greater degree of heat, from two molecules of the acid a molecule of water was separated, and a substance obtained consisting of two groups of atoms connected by an atom of oxygen. By treatment with anhydrous acetic acid Dr. Schotten established that cholic acid was both monobasic and monovalent. Finally he investigated the composition of human bile from 350 gall-bladders, with a view to testing the statement that in human bile was contained a peculiar cholic acid, the anthropocholic acid of Herr Beyer. Although at first he received the same results, viz. a salt of baryta containing much less carbon than the other cholic acids, yet subsequently, by continued purification and transcrystallisation of the product, he came to the conviction that in the human bile only the taurocholic acid of horned cattle was present. The results at first obtained of apparently different significance were due to the fact that the soluble barytic cholate with carbonate of barium very readily formed insoluble double salts which were not easily split.—Dr. Biondi spoke on the intermaxillary bone, and discussed the fact that the doctrine set up by Goethe, that on each side but one intermaxillary bone was developed, namely from the frontal process, while the superior maxilla, on the other hand, was evolved from the maxillary process of the skull, had, in the year 1879, been replaced by a new doctrine advanced by Herr Albrecht. According to this new doctrine two intermaxillary bones were developed on both sides, growing out of the lateral and median frontal process, and then coalescing with the superior maxilla from the maxillary process. According to the older view, at present defended in particular by Dr. Kölliker, the hare-lip originated between superior maxilla and intermaxillary bone. Prof. Albrecht, on the other hand, removed the position of the hare-lip to between median and lateral intermaxillary bone. By way of proof for this latter view, the circumstance was adduced that externally from the fissure an incisor tooth was regularly found. Dr. Biondi had examined a very large number of normal and pathological skulls, and had followed the development in embryos of the facial bones. Like Prof. Albrecht, he regularly found an incisor tooth externally from the hare-lip fissure, and, in the case of embryos, in the intermaxillary bone two points of ossification, whence were developed two separate intermaxillary bones. Between these two were situated the hare-lip fissure and that of the palate. The views of Dr. Biondi and of Prof. Albrecht deviated on the contrary very materially from each other respecting the place where the two intermaxillary bones originated. In accordance with the speaker's views, the superior maxilla and the outer intermaxillary bone developed from the maxillary process, while, on the other hand, the inner intermaxillary bone sprang from the median frontal process. The lateral frontal process did not reach so far down. The hare-lip, in point of fact, therefore, as had been maintained by earlier authorities, was situated between the maxillary and frontal process. The upper lip, in the opinion of the speaker, developed itself, in perfect accordance with the relations obtaining in respect of the superior maxilla and its alveolar margin, out of the maxillary process and the inner frontal process, while the

outer frontal process formed the alæ nasi. In respect of the two intermaxillary bones on each side, the presence of which the speaker assumed along with Prof. Albrecht, Dr. Biondi deviated from the latter in so far as that he had found, not an outer and inner intermaxillary bone on each side, but an anterior and posterior. The incisor teeth, as also the supernumerary teeth, developed themselves only in the intermaxillary bone. Dr. Biondi illustrated his address by preparations, drawings, and photographs he produced.—Dr. Pohl-Pincus next gave a supplement to his address on the polarisation colours of the hair of the human head, adducing the reasons which determined him to lay down three types of colouring: the normal, the pathologic, and an intermediate type. It was nevertheless to be understood that a whole series of transitional hues intervened between the two extremes. He further stated that, in accordance with his experience, hair pathologically changed in its double refraction in consequence of stimulation from inflammation or from psychical excitement was long in returning to its normal condition. The speaker next described two experiments on a frog's heart. When he removed from a frog the anterior part of the cerebrum, under avoidance of heavy bleedings, then set free the heart, and stimulated one or several sensory nerves of the body, he then observed that the systole of the heart was unchanged. During the diastole, however, there appeared on the surface a chess-board-like drawing, and the diastole itself was interrupted in the middle by an intermission. By stimulation of the vagus he was able to overcome this effect of the irritated sensory nerves. The second observation he communicated respected the local diastole which a considerable time previously had been noticed by others as well as by himself. The occurrence of this diastole under local mechanical stimulation of the frog's heart was always a very uncertain one. Dr. Pohl-Pincus had now quite recently found that the local dilatation took place only when the stimulation was given during the second half of the systole. At the beginning of the systole, on the other hand, the stimulation had no effect whatever, and during the diastole it even gave rise to local systole. The effects of the local mechanical stimulation lasted some time, and, besides the local contraction or relaxation, manifested itself in a heightening of the diastolic or systolic state on each occasion at the stimulated spot.

Physical Society, April 2.—Prof. du Bois Reymond spoke on the irreciprocal conduction of electricity found by him in the electrical organ of fishes, and discussed the teleological significance of this property for the capability of fishes to discharge strong electrical currents outwardly (*NATURE*, vol. xxxiii. p. 407).—Following up the address at the last sitting by Dr. Baur, Dr. Peinet spoke on some other more recent thermostats, in particular on those which effected the regulation by means of vapour pressure. In the closed short leg of a manometer was a small quantity of a fluid readily susceptible of evaporation; above it was placed quicksilver, which also filled the long leg of the manometer. The short leg of the manometer with the fluid referred to lay in the bath, the temperature of which should be kept constant. Did the temperature rise above the desired degree, then the quicksilver of the manometer also mounted in consequence of the pressure of the vapour, and the flow of the gas to the flame got thereby in part shut off. The temperature then sank, the vapour condensed, and the quicksilver in the manometer fell. To render the apparatus available at every over-pressure, the manometer was cut through and connected by a movable piece of tube. As the material best adapted for these flexible connections, the speaker recommended thin steel tube, which was coated over with lead, thereby rendering it easily pliable and not liable to any elastic after-effect. The regulation by means of the long manometer tube was accomplished in an electrical way by an electro-magnet. The details of the arrangement of the thermostats in question were illustrated in part by models, in part by drawings. As fluid for very low temperatures, a mixture of two hydrochloric ethers was used; for higher temperatures, a mixture of ether and alcohol; for temperatures above 100° C., water; and for still higher degrees of temperature, other fluids. With respect to the efficacy of these thermostats, the speaker adduced that he was able to keep a water-bath for a considerable length of time constant to within 0°·02 C.—Dr. König laid before the Society a photometer sent to him from Messrs. Yeates and Son, of Dublin, which apparently far surpassed the Bunsen photometer. It consisted of two quadratic prisms of cast paraffin connected with each other on a longitudinal side. Between these two prisms was placed a silver leaf or a tinfoil leaf. When light from one source

fell on the one prism, then it appeared clear white on account of the diffused reflexions. The light was able to penetrate to the other only through the metal sheet. The other prism therefore appeared dark. If a second light was placed on the other side, then the other prism appeared likewise bright. By displacement on a scale the photometer could be brought into the position in which both sides appeared equally bright. The distance from each other of the two sources of light gave in that case the relation to each other of the intensities. The speaker proposed some arrangements which would render this photometer available for coloured light as well. Similar proposals for this purpose had already been made by Dr. Jolly.—Dr. König further made some supplementary communications on the case recently discussed by him of anomalous colour-seeing arising from alcoholism. After determining that the occurrence of a neutral point in the spectrum was a perfectly certain proof that the eyes in question perceived only two fundamental colours, he investigated the extension of the colour curves by the employing of mixed colours, and thereby obtained important results, which he promised to communicate to the Society in a complete form in May or June next.

BOOKS AND PAMPHLETS RECEIVED

"Hand-book of Plant Dissection," by Arthur, Barnes and Coulter (Holt, New York).—"Manual of Physical Geography of Australia," by H. B. de la Poer Wall (Robertson, Melbourne).—"Journal of the Chemical Society," May (Van Voorst).—"Papers and Proceedings of the Royal Society of Tasmania for 1885" (Tasmania).—"Journal of the Royal Agricultural Society of England," April (Murray).—"Proceedings of the Bath Natural History and Antiquarian Field Club," No. 1, vol. vi. (Davies, Bath).—"The Topographic Features of Lake Shores," by G. K. Gilbert (Washington).—"Oils and Varnishes," by J. Cameron (Churchill).—"Year-Book of Scientific and Learned Societies, 1886" (Griffin).—"Notes on Analytical Chemistry," 2nd edition (Churchill).—"Mountain Ascents," by J. Barrow (Low).—"Dogs in Disease," 2nd edition, by Ashmont (Low).—"Bulletin de la Société Impériale des Naturalistes de Moscou," Nos. 1 and 2 (Moscou).—"British Petrography," part 4, by J. J. H. Teall (Watson, Birmingham).—"Missionary Work among the Ojibway Indians," by Rev. E. F. Wilson (S.P.C.K.).—"Our Island Continent," by Dr. J. E. Taylor (S.P.C.K.).—"A Manual of the Diseases of the Elephant," by J. H. Steel (Moore Madras).—"A Treatise on Elementary Statics," by J. Greaves (Macmillan).

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